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spore, or oöspore of Phanerogams, is the single fertilized cell in the embryo-sac, which at once develops into the embryo, at which point Phanerogams pass into the resting stage, in this group called "the seed." The sex-spore, since the fourth group, has become such an evanescent thing, so out of reach of common observation, that very naturally it has been the common opinion that the comparatively permanent asexual spores are sex affairs. Sex-spores are directly formed by sex-union; while pollen-grains and embryo-sacs are never formed in any such way. Thus have I hastily traced one of the principal threads upon which our botanical facts are strung. And as one examines the subject in more of its details, he becomes irresistibly impressed with the idea that here is a great scheme of development, directed by laws of which we are beginning to catch glimpses, and by which the whole fabric of a great kingdom has been beautifully and continuously worked out.

RECENT LITERATURE.

THE GEOLOGICAL HISTORY OF PLANTS. By SIR J. WILLIAM DAWSON, C.M.G., LL.D., F.R.S., etc. International Scientific Series. New York, 1888.—This book is a striking example of the truth that scientific specialists cannot be induced to say much about things which they have not themselves carefully studied. Purporting to treat a great department of palæontology from a cosmopolitan standpoint, it is really a summary of the author's own extensive researches within the British American Provinces, enriched by much comparative matter drawn from similar phenomena in other lands. What is therefore lost in generality is gained in thoroughness and reliability. There is no branch of science that stands more in need of summarizing and systemizing than that of palæobotany, and every book that successfully attempts this should be warmly welcomed. With the above qualification this work does this, and it is therefore a valuable contribution to the thus far scattered and desultory literature of the subject. Taking up the several geological formations in their ascending order, the characteristic vegetation of each is ably portrayed by the author, though with an unevenness of treatment corresponding to the imperfection of the geological record in the region to which he has devoted his life. The vegetable origin of the Laurentian graphite is defended with great force, and the existence of a primordial flora contemporaneous with *Eozoon canadense* is maintained. Most of the alleged

plants of the Cambrian and Silurian seas are thrown out, but Nematophyton, Protannularia, and some species of Buthotrephis are marked as genuine. A special feature is the working out more elaborately than in any other place of his theory of an early Rhizocarpean flora culminating in the Devonian. Much space is given to the flora of this period, so well developed in Acadian territory, and so unimportant in other countries, and his name "Erian" is constantly used and specially defended. The Carboniferous flora takes a subordinate rank, but the extended notes to that chapter are crowded with valuable information, much of which would be new to any but the thoroughly informed specialist. The early Mesozoic (Triassic and Jurassic), not being represented in Canada, is given a very short chapter, largely devoted to the history of Ginkgo and Sequoia as worked out by Heer, Saporta and others. More prominence is given to the Cretaceous, and the interesting plant-bearing deposits of the Kootanie (Neocomian), Dunvegan (Cenomanian), and Belly River (Senonian) series in the Northwest Territories receive special attention. The Laramie group, as it occurs on the St. Mary River, on Willow Creek, and on Porcupine Hill, is also well characterized and illustrated. The great Miocene flora, which ranks next in abundance to the Carboniferous, is passed over nearly in silence, but some very important deductions are drawn from the little flora on Green's Creek, central Canada, in the Leda clay, believed by him to have been deposited at about the time of maximum glacial refrigeration. The work closes with a chapter on the origin and migration of plants, and the relations of recent to fossil floras.

In this book Sir William Dawson naturally takes occasion to give his views on most of the disputed questions in phytopalæontology. A few of the more important of these may be mentioned here: He accepts and reiterates the Brongniartian hypothesis of the greater abundance of carbon dioxide in the atmosphere during palæozoic time, but without denying the possibility of the cosmical origin of portions of it, as maintained by Dr. T. Sterry Hunt. He insists upon the substantial uniformity of the fossil floras, especially the Palæozoic, over the whole globe, and expresses his convictions that, "with reference to the Erian and Carboniferous floras of North America and of Europe, the doctrine of 'homotaxis,' as distinct from actual contemporaneity, has no place." He agrees with Gardner that the Laramie group is probably of the same age as the arctic Miocenes of Heer, and that these are not Miocene but Eocene, also that allowance should be made for differences of latitude, although this is not sufficient to amount to an entire geologic period. On the leading taxonomic question as to the position of Sigillaria, he accepts Williamson's proof of the existence of truly exogenous cryptogams, but from the frequent occurrence of taxine fruits in the same beds with Sigillarian

trunks he inclines to the opinion that these will yet be found attached, and that some forms, at least of Sigillaria, must have been coniferous. In this connection he discredits the statements of Goldenberg relative to the fruits of Sigillaria, but seems to be unacquainted with the important paper of Zeiller, which has certainly done more to settle the question than any other discovery.

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